AMENDMENTS TO THE CLAIMS

1. (Currently amended) A method for determining the hardening depth of a ferro or ferrimagnetic ~~substance~~ measurement object, comprising, ~~in which method~~

~~–~~creating a varying magnetic field ~~in created~~ in the measurement object,

- regulating the varying magnetic field such that the maximum strength of the magnetic field is at most 110% of a value of a coercitive force of a hardened part of the measurement object,

- measuring ~~the~~ Barkhausen noise arising from the varying magnetic field, and ~~which originates~~ originating from the measurement object, ~~is measured, and~~

- determining a ~~the~~ value ~~depicting~~ representing an ~~the~~ energy of the measured noise ~~is determined, for example, by integration or summing~~, and

- determining a ~~the~~ hardening depth of the measurement object ~~is determined~~ on the basis of the value ~~depicting~~ representing the energy of the measured noise~~,~~.

~~characterized in that~~

~~- the varying magnetic field created in the measurement object is regulated, in such a way that the maximum strength of the magnetic field is at most 110 % of the value of the coercitive force of the hardened part of the object being measured.~~

2. (Currently amended) A method according to Claim 1, ~~characterized in that~~ wherein the ~~noise signal~~ measured Barkhausen noise is converted to the frequency level using, ~~for example, with the aid of~~ a discrete-time Fourier transformation, ~~such as FFT transformation.~~

3. (Currently amended) A method according to Claim 2, ~~characterized in that~~ wherein the

value ~~depicting~~ representing the energy of the measured noise is determined by integrating the measured Barkhausen noise ~~signal~~ converted to the frequency level, over a specific frequency band~~, such as 10 - 1200 Hz~~.

4. (Currently amended) A method according to ~~any of Claims 1 - 3, characterized in that~~ Claim 1, wherein the hardening depth of the measurement object is determined on the basis of the value ~~depicting~~ representing the energy of the noise, with the aid of a table or formula, which is defined with the aid of test measurements.

5. A method according to ~~any of Claims 1 - 4, characterized in that~~ claim 4, wherein the varying magnetic field created in the measurement object is regulated in such a way that the maximum strength of the magnetic field does not exceed the coercitive force of the hardened part of the measurement object, but does exceed the coercitive force of the unhardened part of the measurement object.

6. (Currently amended) A method according to ~~any of Claims 1 - 4, characterized in that~~ claim 4, wherein the magnetic field created in the measurement object is regulated in such a way that the maximum strength of the magnetic field is at most 105 % of the value of the coercitive force of the hardened part of the measurement object.

7. (Currently amended) A method according to ~~any of Claims 2 - 6, characterized in that~~ claim 2, wherein

- the measured noise signal is converted to the frequency level using a ~~with the aid of a Fourier transformation, such as~~ FFT transformation, and

- ~~the~~ a sampling frequency used in ~~the~~ measurement and conversion and ~~the~~ a frequency of the varying magnetic field created in the measurement object are essentially synchronized with ~~the~~ a frequency of ~~the~~ a power-supply network, and

- ~~the~~ a measurement time is essentially a multiple of the periods corresponding to the frequency of the varying magnetic field created in the measurement object.

8. (Currently amended) A method according to ~~any of Claims 1 - 7, characterized in that~~ claim 1, wherein the frequency of the varying magnetic field created in the measurement object is less than 10 Hz.

9. (Currently amended) A method according to ~~any of Claims 1 - 7, characterized in that~~ claim 1, wherein the frequency of the varying magnetic field created in the measurement object is less than 20 Hz.

10. (Currently amended) A method according to ~~any of Claims 1 - 9, characterized in that~~ claim 1, wherein the ~~magnetic~~ Barkhausen noise caused by the varying magnetic field is measured with the aid of a coil sensor~~, which is~~ optimized for ~~low~~ frequencies~~, i.e., for example,~~ of 10 Hz - 2 kHz.

11. (Currently amended) An arrangement for determining the hardening depth of a ferro or ferrimagnetic ~~substance~~ measurement object, comprising, ~~which arrangement includes~~

- a magnetization coil [[(13)]] for creating a varying magnetic field in the measurement object,

- a sensor [[(14)]] for measuring ~~the~~ a magnetic Barkhausen noise originating from the measurement object, ~~which is~~ and caused by the varying magnetic field,

- an apparatus [[(4)]], ~~which is~~ arranged to determined ~~the~~ a value ~~depicting~~ representing an ~~the~~ energy of the measured magnetic Barkhausen noise and to determine the hardening depth of the measurement object on the basis of this value, and

~~characterized in that the arrangement includes~~

- a magnetization circuit ~~(10), which is~~ arranged to regulate the varying magnetic field created in the measurement object, in such a way that the maximum strength of the magnetic field is at most 110 % of the value of ~~the~~ a coercitive force of ~~the~~ a hardened part of the measurement object.

12. (Currently amended) An arrangement according to Claim 11, ~~characterized in that~~ wherein the apparatus [[(4)]] is ~~arrangement~~ arranged to convert the measured Barkhausen noise ~~signal measured using the sensor (14)~~ to the frequency level using~~, for example, with the aid of~~ a discrete Fourier transformation~~, such as FFT transformation~~.

13. (Currently amended) An arrangement according to Claim 12, ~~characterized in that~~ wherein the apparatus [[(4)]] is arranged to determine the value of the energy of the measured Barkhausen noise by integrating the measured Barkhausen noise ~~signal~~ converted to the frequency level over a specific frequency band~~, such as 10 – 120 Hz~~.

14. (Currently amended) An arrangement according to ~~any of Claims 11 – 13, characterized in that~~ Claim 11, wherein the apparatus [[(4)]] is arranged to determine the hardening depth of the measurement object, on the basis of the value ~~depicting~~ representing the energy of the noise, with the aid of a table or formula, which is defined with the aid of test measurements.

15. (Currently amended) An arrangement according to ~~any of Claims 11 – 14, characterized in that~~ claim 14, wherein the arrangement includes a magnetization circuit ~~(10), which is~~ arranged to ~~regulated~~ regulate a~~the~~ magnetization current fed to the magnetization coil [[(13)]] and the magnetic field created by the magnetization current, a magnetization flux measurement circuit ~~(8), which is~~ arranged to measure the magnetization flux created by the

magnetization coil , with the aid of the coil [[(12)]], and/or a magnetization current measurement ~~circuit (9), which is~~ arranged to measure the current travelling through the magnetization coil [[(13)]].

16. (Currently amended) An arrangement according to Claim 15, ~~characterized in that~~ wherein the apparatus [[(4)]] is arranged to regulate the strength of the magnetic field created in the measurement object by the magnetization coil [[(13)]], with the aid of the magnetization circuit [[(10)]], the magnetization flux measurement circuit [[(8)]], and/or the magnetization current measurement circuit [[(9)]], in such a way that the maximum force of the magnetic field does not exceed the coercitive force of the hardened part of the measurement object, but does exceed the coercitive force of the unhardened part of the measurement object.

17. (Currently amended) An arrangement according to Claim 15, ~~characterized in that~~ wherein the apparatus [[(4)]] is arranged to regulate the strength of the magnetic field created in the measurement object by the magnetization coil [[(13)]], with the aid of the magnetization circuit ~~(10)~~, the magnetization flux measurement circuit [[(8)]], and/or the magnetization current measurement circuit [[(9)]], in such a way that the maximum strength of the magnetic field is at most 105 % of the value of the coercitive force of the hardened part of the measurement object.

18. (Currently amended) An arrangement according to ~~any of Claims 15 – 17, characterized in that~~ claim 15, wherein the apparatus [[(4)]] is arranged to regulate the strength of the magnetic field created in the measurement object by the magnetization coil [[(13)]], with the aid of the magnetization circuit [[(10)]], the magnetization flux circuit [[(8)]], and/or the magnetization current circuit [[(9)]], in such a way that the magnetization flux settles to an essentially constant value, independently of the measurement object.

19. (Currently amended) An arrangement according to ~~any of Claims 12 – 18, characterized in that~~ claim 12, wherein the apparatus [[(4)]] is arranged to convert the measured noise signal to the frequency level~~, for example, with the aid of Fourier transformation such as~~

using a FFT transformation, and to use in the conversion a sampling frequency, which is essentially synchronized with ~~the~~ a power-supply network frequency and the frequency of the varying magnetic field created in the measurement object, and a measurement time, which is essentially a multiple of the periods corresponding to the frequency of the varying magnetic field created in the measurement object.

20. (Currently amended) An arrangement according to ~~any of Claims 15 – 19, characterized in that~~ claim 15, wherein the apparatus [[(4)]] is arranged to regulate the frequency of the magnetic field created in the measurement object by the magnetization coil [[(13)]] to less than 10 Hz, with the aid of the magnetization circuit [[(10)]], the magnetization flux measurement circuit [[(8)]], and/or the magnetization current measurement circuit [[(9)]].

21. (Currently amended) An arrangement according to ~~any of Claims 15 – 19, characterized in that~~ claim 15, wherein the apparatus [[(4)]] is arranged to regulate the frequency of the magnetic field created in the measurement object by the magnetization coil [[(13)]] to less than 20 Hz, with the aid of the magnetization circuit [[(10)]], the magnetization flux measurement circuit [[(8)]], and/or the magnetization current measurement circuit [[(9)]].

22. (Currently amended) An arrangement according to ~~any of Claims 11 – 21, characterized in that~~ claim 11, wherein the sensor [[(14)]] is a coil sensor~~, which is~~ optimized for low frequencies~~, i.e., for example, for frequencies~~ of less than 1 - 2 kHz.